

WHAT IS CLAIMED IS:

1. A prober for measuring electrical characteristics of a test target object, the prober comprising:

5           a stage which places a test target object thereon, the test target object having a plurality of electrical circuit devices on a surface thereof, each of the electrical circuit devices having a plurality of electrodes on a surface thereof;

10           a probe card which is arranged above the stage, the probe card comprising a plurality of probes;

              a first sensor which detects positions of distal ends of the probes;

15           a second sensor which detects a surface position of an individual one of the electrical circuit devices; and

20           a controller which brings the probes of the probe card and the electrodes of the electrical circuit devices into contact with each other on the basis of the positions of the distal ends of the probes detected by the first sensor and the surface position of each of the electrical circuit devices detected by the second sensor, the controller sequentially performing the contact for each of the plurality of electrical circuit devices.

25           2. A prober according to claim 1, wherein the surface position of the individual one of the

electrical circuit devices detected by the second sensor is an average position of surfaces of said plurality of electrodes of the individual one of the electrical circuit devices.

5           3. A prober according to claim 1, wherein the first sensor comprises a load sensor, and the load sensor detects whether the probes are in contact with a surface of the sensor.

10          4. A prober according to claim 1, wherein the ~~second sensor~~ comprises:

15          a second image sensing mechanism which comprises a light irradiation mechanism that comprises a light source, and the second image sensing mechanism senses surfaces of the electrodes of the electronic circuit devices formed on the test target object; and

20          a pupil sensor which pupil-splits reflected light from the surfaces of the electrodes so that a focal point of the second image sensing mechanism coincides with the surfaces of the plurality of electrodes of the electrical circuit devices formed on the test target object, and obtains defocus amounts of the surfaces of the electrodes on the basis of split light quantity distributions.

25          5. A prober according to claim 4, wherein the second sensor further comprises a third image sensing mechanism which senses an entire image of the test target object.

6. A prober according to claim 2, wherein the second sensor detects positions of three electrodes of each of the electrical circuit devices in order to detect an average position of the surfaces of the 5 plurality of electrodes of each of the electrical circuit devices.

7. A prober according to claim 4, wherein the pupil sensor comprises:

a first view field limiting member which is provided between the light source and the electrodes 10 and limits the irradiation light within a predetermined region with a light-aperture having a predetermined shape;

15 a pupil splitting member which pupil-splits the irradiation light, limited within the predetermined region, irradiated on the electrodes, and consequently reflected by the electrodes, into first and second beams;

20 a light-receiving member which obtains light quantity distributions of the first and second beams from the pupil splitting means; and

25 an arithmetic operator which calculates the defocus amounts of the surfaces of the electrodes on the basis of the light quantity distributions of the first and second beams.

8. A prober according to claim 4, wherein the controller comprises:

an arithmetic operator which obtains the defocus amounts from a predetermined position on the basis of position information on the surfaces of the electrodes from the pupil sensor; and

5           a stage driving mechanism which moves the stage on the basis of an arithmetic operation result of the arithmetic operator so that a focal point of the second image sensing mechanism coincides with the surfaces of the electrodes.

10           9. A prober according to claim 4, wherein the pupil splitting member comprises one of a pupil splitting lens, a pupil splitting prism, and a pupil splitting mirror.

15           10. A prober according to claim 4, wherein the pupil sensor further comprises a second view field limiting member which limits the reflected light from the electrodes.

20           11. A prober for measuring electrical characteristics of a test target object, the prober comprising:

25           a stage which places a test target object W thereon, the test target object having a plurality of electrical circuit devices on a surface thereof, each of the electrical circuit devices having a plurality of electrodes on a surface thereof;

              a probe card which is arranged above the stage, the probe card comprising a plurality of probes;

a first sensor which comprises a load sensor, the load sensor detecting whether distal ends of the probes are in contact with a surface of the load sensor;

5 a second sensor which detects an average position of a surface of the test target object, and

a controller which brings the probes of the probe card and the electrodes of the electrical circuit devices into contact with each other on the basis of the positions of the distal ends of the probes detected  
10 by the first sensor and the positions of surfaces of the electrodes of each of the electrical circuit devices detected by the second sensor, the controller sequentially performing the contact for each of the plurality of electrical circuit devices.

15 12. A prober for measuring electrical characteristics of a test target object, the prober comprising:

measurement means for measuring electrical characteristics of a plurality of electronic circuit  
20 devices formed on the test target object;

support means for placing the test target object thereon, the test target object having a plurality of electrical circuit devices on a surface thereof, each of the electrical circuit devices having a plurality of electrodes on a surface thereof;

25 a probe card which comprises a plurality of probes that are connected to the measurement means;

first detection means for detecting positions of distal ends of the probes;

second detection means for detecting a surface position of an individual one of the electrical circuit devices; and

control means for bringing the probes of the probe card and the electrodes of the electrical circuit devices into contact with each other on the basis of the positions of the distal ends of the probes detected by the first sensor and the surface position of each of the electrical circuit devices detected by the second sensor, the control means sequentially performing the contact for each of the plurality of electrical circuit devices.

13. A prober according to claim 12, wherein the second detection means detects an average position of the surfaces of said plurality of electrodes of the individual one of the electrical circuit devices.

14. A probing method of testing electrical characteristics of a plurality of electronic circuit devices formed on a test target object placed on a stage by using a prober having a probe, the probing method comprising:

(a) detecting a position of at least one probe with a first image sensing mechanism;

(b) causing a focal point of the first image sensing mechanism and a focal point of a second image

sensing mechanism to coincide with each other, to detect positions of surfaces of the electronic circuit devices;

5 (c) detecting a position of a surface of the stage;

(d) placing the test target object on the stage;

10 (e) aligning the probe and surfaces of electrodes of the electronic circuit devices formed on the test target object, the step comprising;

15 (e1) irradiating at least one predetermined region of the electronic circuit devices with light;

20 (e2) extracting reflected light from the predetermined region into a focal point detection optical system;

25 (e3) pupil-splitting the reflected light into first and second light in the focal point detection optical system;

(e4) obtaining defocus amounts of the surfaces of the electronic circuit devices on the basis of light quantity distributions of the first and second light; and

25 (e5) moving the stage on the basis of the defocus amounts, thereby causing the focal point of the second image sensing mechanism and the surfaces of the electrodes of the test target object to coincide with each other, and

(f) bringing the probe and the electrodes of the test target object into contact with each other.

15. A method according to claim 14, wherein the step (c) of detecting the position of the surface of the stage is performed by detecting a position of a surface of a load sensor added to the stage.  
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16. A method according to claim 14, wherein the step (b) is performed again between the steps (d) and (e).

10 17. A method according to claim 14, further having a step of mapping the defocus amounts, obtained by the step (e4) of obtaining the defocus amounts of the surfaces of the electronic circuit devices, in a storage.

15 18. A method of measuring electrical characteristics of a plurality of electronic circuit devices formed on a test target object by using a prober, the method comprising:

20 (a) detecting a position of at least one probe among a plurality of probes provided to a probe card;

(b) causing a focal point of a first image sensing mechanism and a focal point of a second image sensing mechanism to detect positions of surfaces of the electronic circuit devices to coincide with each other;

25 (c) detecting a position of a surface of each of the electrical circuit devices formed on a surface of the test target object placed on a stage;

(d) placing the test target object on the stage, each of the plurality of electrical circuit devices formed on the test target object comprising a plurality of electrodes on a surface thereof; and

5 (e) bringing the plurality of probes and a predetermined electrode of one of the electrical circuit devices into contact with each other on the basis of the detected position of the probe and positions of the electrodes.

10 19. A method according to claim 18, wherein the position of the surface of each of the electrical circuit devices detected in the step (c) is an average position of the surfaces of said plurality of electrodes of each of the electrical circuit devices.

15 20. A method according to claim 19, wherein the step (c) of detecting the average position of the surfaces of said plurality of electrodes is performed by using a pupil sensor which pupil-splits reflected light from the surfaces of the electrodes and detects 20 defocus amounts of the surfaces of the electrodes on the basis of split light quantity distributions.

25 21. A method according to claim 20, wherein the step (c) of detecting the average position of the surfaces of said plurality of electrodes is performed for three electrodes per electrical circuit device.

22. A method according to claim 20, wherein the step (a) of detecting the position of the probe

comprises a step which is performed by using a load sensor fixed to the stage.

23. A method according to claim 22, wherein the load sensor is fixed to the stage.

5 24. A method according to claim 20, wherein the detection step performed by using the pupil sensor comprises:

10 (a1) irradiating a predetermined region of a surface of one electrode of at least one electrical circuit device on the test target object placed on the stage;

(a2) pupil-splitting reflected light reflected by the predetermined region into first and second light;

15 (a3) obtaining light quantity distributions of the first and second light, respectively, with a photosensor;

(a4) obtaining a defocus amount of the surface of one electrode on the basis of the light quantity distributions of the first and second light; and

20 (a5) repeating the above steps, thereby detecting an average defocus amount of the surfaces of said plurality of electrodes of each of the electrical circuit devices formed on a surface of the test target object.

25 25. A method of measuring electrical characteristics of a plurality of electronic circuit devices formed on a test target object by using a prober, the

method comprising:

- (a) detecting a position of at least one probe among a plurality of probes provided to a probe card;
- (b) causing a focal point of a first image sensing mechanism and a focal point of a second image sensing mechanism to coincide with each other, to detect positions of surfaces of the electronic circuit devices;
- (c) detecting a position of a surface of each of the electrical circuit devices formed on a surface of the test target object placed on a stage;
- (d) placing the test target object on the stage, each of the plurality of electrical circuit devices formed on the test target object comprising a plurality of electrodes on a surface thereof; and
- (e) bringing the plurality of probes and a predetermined electrode of one of the electrical circuit devices into contact with each other on the basis of the detected position of the probe and the positions of the surfaces of the electrical circuit devices.

26. A method according to claim 25, wherein the position of the surface of each of the electrical circuit devices detected in the step (c) is an average position of the surfaces of said plurality of electrodes of each of the electrical circuit devices.

27. A method according to claim 26, wherein the

step (c) of detecting the average position of the surfaces of said plurality of electrodes is performed by using a pupil sensor which pupil-splits reflected light from the surfaces of the electrodes and detects defocus amounts of the surfaces of the electrodes on the basis of split light quantity distributions.